an exceedingly limited number of recommendations to the Government. One of them relates to the organisation of the meteorological service. The Association directs the attention of the Government to the inferiority of French meteorology, and urges the Government to establish an official investigation into its working. All efforts to take the Service des Avertissements out of the hands of the observatory have been defeated. The proposed reform does not aim at diminishing the influence of M. Leverrier on the service he has created in France.

A request is to be sent to the Government to endow the Geological Society of Normandy with the privileges of an institution of public interest, which means to grant it a charter and incorporate it. It is expected that the admirable geological exhibitions collected through M. Lennier's exertions will remain permanent, and become a fair specimen of regional geology. A number of exhibitors have consented either to give their objects or to lend them until similar objects can be procured in their stead. M. Lennier, whose exertions have been indefatigable, is the director and founder of the Havre Aquarium, which is a model institution, not for the variety of species, but for the number of objects and the health of the animals.

The several industrial establishments at Havre were opened for public inspection, as well as the Government buildings. The most interesting object was a fog trumpet of British make. The steam engine working it has a power of three horses. It is calculated to compress about 800 litres of air at a pressure of little more than two atmospheres in two tanks put into communication by a large tube. One of these tanks is in communication with the pump, and the other with the trumpet. The latter is closed by a self-acting valve, which opens once every forty-eight seconds, and during seven seconds gives a voluminous sound in *la* of the diapason.

The last excursion (to Rouen) was more successful than the first. The *Frigorifique* had been sent from Havre to Rouen in order to increase the attraction, and was visited by many of the excursionists.

The number of members of the Havre meeting was not more than 600 altogether. The foreign members numbered about forty, upwards of twenty being Englishmen. Very few ladies attended the proceedings. No final banquet took place, owing probably to the fear of some political discussion disturbing an assembly which ought to be devoted entirely to science.

There is only a single scientific society in Havre which, in spite of its ambitious title (Société d'Etudes diverses) has only sixty members out of a population of 85,000, including more than fifty millionaires. The society meets regularly and publishes yearly a handsome volume. It has been decided to establish a local society of commercial geography, and a local committee to collect meteorological observations taken on board the transatlantic steamers.

If we consider the work done in certain sections the Havre meeting has not been a failure; but it was altogether a sectional meeting from the inaugural speech of President Broca to the two or three lectures which were delivered in the theatre. We are confident that M. Fremy will spare no pains to render the Paris meeting next year a success and as far as possible international. He will endeavour to get the presidents of sections each to deliver an inaugural address. It is intended to establish a temporary daily newspaper to publish at full length the reports of sectional proceedings, &c.

In the Section of Meteorology the principal business was the vote of the requisition sent to the Government, which will probably induce the Ministry to increase the grant to French meteorology. The majority of the section are in favour of the establishment of a central meteorological institute to investigate large meteorological problems and centralise all meteorological services except weather previsions. A resolution was proposed by Dr. Janssen, urging transatlantic companies to take meteorological observations on board; another resolution asked M. Giffard to organise a meteorological observatory on board his captive balloon, during the exhibition of 1878. Mr. James Glaisher gave an address on the result of his thirty scientific ascents, and the experiments made in the Ashburnham captive balloon. His address was well received, and he was invited to sit with the bureau. M. Alluard, the Director of the Puy-de-Dôme Observatory, engaged to establish intermediate stations on the flanks of the mountain, and to keep observations during the time when the monster captive balloon is making its ascents. This proposal will be communicated to Gen. Nansouty, Director of the Pic-du-Midi Observatory. A resolution was voted protesting against the delays in the construction of a telegraph line from Pic-du-Midi to Bagnères, for the purpose of sending regular observations during the time when the observatory is cut off by snow from all communication with the world below.

M. Alluard presented to the section diagrams of comparative barometric measures taken on the summit of the Puy-de-Dôme and at Clermont-Ferrand during storms. This shows clearly that the law of pressure varies in inverse ratio, diminishing on the top of the mountains when increasing at Clermont, and *vice versa.* It shows evidently that storms are produced, not by a single wind, but by a conflict of several winds at a certain distance from the earth.

In the Geological Section a large proportion of the papers were on various points connected with the geology of Normandy, one of the most important being a paper by M. Morière on the presence of the liassic stage in the department of Orne and on the fossils he has collected during many years investigation into the geology of the region. In this section, also, M. Pomel read a long paper to prove that M. Roudaire's project of an inland sea in Algeria, of which we recently gave details, is impossible M. Pomel maintains that the level of the Chotts is too high, and that if by any process they could be filled, the water would very soon find its way back to the Mediterranean. Another paper of some importance was by MM. de Tromelin and Grasset, being a "Summary Study of the Palæozoic Fauna of Lower Languedoc and the Pyrenees," for the purpose of comparing the primary formations of the South with those of the North-West of France. M. Jannettaz gave an account of his observations on the propagation of heat in schistose rocks and in crystals. From his experiments he concludes that heat is transmitted more readily along the planes of cleavage of crystals and along the plane of schistosity of slates, gneiss, crystalline or agillaceous schists, than along the direction perpendicular to these planes. He thinks we may thus explain, to a great extent, the variation observed in the increase of temperature with depth in different parts of the globe.

In the Botanical Section M. Corenwinder continued his account of his investigations on the Functions of Leaves. After twenty-five years' work M. Corenwinder thus sums up the results he has obtained:—The leaves of vegetables in their relations to the atmospheric air are the seat of two distinct functions. By their protoplasm they absorb oxygen and constantly exhale carbonic acid. By their chlorophyll, they inspire, on the contrary, during the day only, carbonic acid, and expire oxygen. In their early stage the protoplasm predominates; chlorophyll is not abundant. Hence the respiratory function predominates during all that period over the chlorophyllian function, and consequently leaves exhale carbonic acid without interruption. In proportion as leaves grow the colourless protoplasm diminishes and the chlorophyll increases; thus the capacity of emitting carbonic acid rapidly decreases, and soon they exhale, during the day, nothing but oxygen gas. Henceforth it is only by shutting off or diminishing the light, when the action of the chlorophyll is diminished or suspended, that the effect of respiration becomes more or less sensible. There is then among living beings only one kind of respiration. The part played by chlorophyll is of a different order; it is an act of assimilation which has nothing in common with the preceding. M. Corenwinder hopes that henceforth it will cease to be taught that plants are provided with two respirations, one for the day and the other for the night.

NOTES

We are informed by a cable telegram from a New York correspondent that Prof. O. C. Marsh, the eminent palæontologist, has been elected president of next year's meeting of the American Association for the Advancement of Science, which has just concluded its Nashville session. We have received the *Proceedings* of the last year's meeting at Buffalo.

The Aquarium Winter Garden at Tynemouth, near Newcastle, is rapidly approaching completion. The building occupies a commanding position on the Long Sands between the town of Tynemouth and the little fishing village of Cullercoats. The entire basement is devoted to the Aquarium with its reservoirs and pumping machinery, and the show tanks, of which there will be both a sea and a fresh-water series, will contain upwards of 140,000 gallons of water. The plan adopted is the circulation system, which has proved so successful in the maintenance of aquatic life at the Crystal Palace, Naples, and elsewhere. Special arrangements are being made for the culture of salmon and trout, and in conjunction with the Aquarium, but out of doors there will be an enormous seal-pond, into which a supply of sea-water will be pumped direct when required. Mr. E. Howard Birchall has been appointed curator.

MR. ALEXANDER BUCHAN, the well-known secretary to the Scottish Meteorological Society, has been sent to Upsala as representative of the Royal Society of Edinburgh, at the celebration of the 400th anniversary of that University.

THE autumn meeting of the Institute of Naval Architects in Glasgow was brought to a conclusion last Thursday, and seems to have been altogether successful. A large number of papers were read and discussion raised on the technical subjects with which the Institute deals, and much of the time was devoted to visiting several of the most important Clyde establishments. The next autumn meeting of the Institute will probably be at Newcastle-on-Tyne.

ON August 29 the Dorset Field Club met at the romantic spot of Lulworth Cove. One section gave themselves to the geology of the district in which the "Purbecks" are so finely exhibited. After some opening remarks by Mr. Mansell Pleydell, the president of the Society, Mr. Damon, F.G.S., gave an address bearing on the geology of the cove and neighbouring strata, followed by Prof. Buckman. Other sections directed their attention to entomology, botany, &c.

A SUMMER school of practical mining for the instruction of the student in the details of miner's work has recently been added to the curriculum of the School of Mines of Columbia College, U.S. This summer school has been put in the charge of Henry S. Munroe, a former graduate of the school, who was recently elected by the trustees to the position of Adjunct Professor. It is proposed that the students of the school shall visit mines in different parts of the country worked for coal, iron, copper, lead, precious metals, &c., and spend a month or six weeks at each, making a careful and detailed study of the mine, and actually engaging, under the instruction of skilled miners, in all the details of mine work. The first experiment was made this summer at the mines of Coxe, Bros., and Co., Drifton, Pa., and with very remarkable success. A dozen students, volunteers from the class of '78, made a stay there of five weeks from July 2. Half of the students worked in the morning and the other half in the afternoon, one squad at a time with each miner. The times of going and coming to and from work were so arranged that each student spent from four to four and a-half hours in the mine each day. On coming out of the mine each squad was required to make a written report of the work done, with sketches showing the location, direction, depth, &c., of each shot fired, and the effect produced. While in the mine they assisted the miner to load his car, thereby learning readily to distinguish "slate" and "bony" from good coal, even in the uncertain light afforded by their mine lamps. They were also instructed in the use of the drill and pick, boring themselves the blast holes, judging the quantity of powder required, making up the cartridge, tamping, and firing the shot. After the students had spent in this way about twenty days at different kinds of work underground and in the "breaker," subjects for more detailed study and investigation were assigned them. Each student, having chosen his theme, spent the remainder of his time in collecting material for a memoir. The experiment has, in fact, been in every way a success.

AT the meeting of the Royal Society of New South Wales on June 6, Mr. Russell exhibited an improved form of bichromate battery, by which the current of electricity generated is kept quite constant so long as it may be required. This is accomplished by allowing the bichromate solution to drop in slowly, and flow out at the same rate through a pipe which commences at the bottom of the cell and passes through the side at three-quarters of an inch from the top. When the supply tap is turned, the solution collects in the cell until it rises to the level of the pipe, and it then begins to pass out as fast as it comes in. As the bichromate solution passes down the cell its active properties are made use of, and when it reaches the bottom it is waste, and passes out as described. In use it is found that the zinc and solution are more economically used than in the ordinary bichromate cell. The Society held its annual *conversazione* on May 16. About 600 members and their friends were present. Amongst the exhibits were some very rare and choice plants from New Guinea. Mr. Russell, Government Astronomer, was most successful in showing large smoke vortex rings, which blew out a spirit-lamp flame at a distance of fifty feet.

THE Report of the Leicester Literary and Philosophical Society speaks satisfactorily of its progress. A year ago the society took possession of new buildings, and its main work as a society is carried on by its six sections, which include the various departments of science. The number of members now exceeds 300.

WE have received a very useful Russian *brochure* by M. Bogdanoff, "A Review of Expeditions and Natural History Researches made in the Aralo-Caspian Region from 1720 to 1874," being the first fascicule of a large work. In 1874 Prof. Barbot-de-Marny, geologist, with MM. Bogdanoff and Butléroff, jun., zoologists, explored vast tracts of land between the Caspian and the Aral lake, and MM. Grimm and Alénitzin studied the fauna of these two interior seas. Preliminary reports by the explorers have been already published. M. Bogandoff's paper is intended to give, in a very condensed form (52 pages), an introductory review of scientific work in the Aralo-Caspian region during the 150 years before this expedition. It has been visited and explored by no fewer than sixty men of science. Yet the great problems so vividly and skilfully developed and discussed by Humboldt and his followers—the problems of the former extension of the Caspian, of its junction with the Aral and the Balkash, of the geological time when this immense interior basin existed, of the causes which determined its drying up and the change of bed of the Amu-darya—all remain as open a field of inquiry as ever. We find immense gaps in every department even in the description of the country. The hydrology of the Caspian and Aral is sufficiently well known, but the third great basin, the Balkash, and a great number of smaller lakes remain unexplored. The flora is well known, and the great work of Borshioff sums up numerous local accounts, but the zoology is very unequally advanced; the lower organisms and the amphibiæ are all but totally unknown. The insects, and still more the vertebrates, are well described, but even in this branch the fishes have been neglected. Prof. Kessler finds many unknown forms even among those of the Caspian, which have been best explored, and the fishes of the Aral and Balkash promise to present plenty of most interesting new forms and varieties. As to the much-debated question of the former bed of the Amu-darya, M. Bogdanoff points out that this remarkable geological phenomenon remains unexplained. We must hope that the labours of the Aralo-Caspian expedition, and of other explorers in the same region, will finally throw some light on the problems involved in the study of this depression of the old continent.

IN an interesting pamphlet on "The Work of Mechanics' Institutes in our Towns," by Mr. Swire Smith, the author contends that the work of mechanics' institutes in towns consists on the one hand in supplying the deficiencies of the day school, and directing its education into useful channels; on the other in giving general information and providing recreation and amusements of a social character. He endeavours to point out the improved prospects of mechanics' institutes in the future, and appeals to public spirit for the erection in many towns of more appropriate buildings. He suggests the propriety of establishing day schools as nurseries for the rudimentary teaching of science, and refers to the help from national and other sources that may be obtained by taking up this work systematically. He urges the vast importance of scientific knowledge for our artisans, the equal importance of a training for girls in the matters appertaining to their welfare, and points out the great need for making classes more attractive. He speaks of the value of penny banks for promoting thrift. Finally, he tries to show the necessity of making the institute more popular as a place of resort for the people of our towns, as a safeguard against pernicious attractions, and for the supply of information, entertainment, and recreation.

IN connection with Capt. Howgate's scheme of Polar exploration, the *Florence*, under Capt. Tyson, of *Polaris* fame, left New London on August 16, *viâ* Cumberland Coast, for whaling purposes. It will then proceed to Greenland to engage Esquimaux families. This pioneer party will meet at Disco, next August, the main Polar expedition under Capt. Howgate. The expedition, it is expected, will be fitted out by the United States Government as soon as Congress meets, and will have voted the required subsidies for establishing a scientific colony at Lady Franklin Bay. The use of balloons having been suggested, Capt. Howgate has written the following letter to M. W. de Fonvielle, who has offered to become a member of the scientific staff of the expedition. It is dated from the "War Department, Office of the Chief Signal Officer, Washington, D.C., August 16, 1877."—"Your valued favour of the 16th June, addressed to Capt. Tyson, was forwarded to me for reply. This reply has been necessarily delayed by the amount of work thrown upon me during the fitting out of the *Florence*. But I avail myself of this first opportunity to say that, should Congress, as I hope, legislate favourably for the proposed Arctic colony at its next session, it is my intention to try the value of balloons as an agent of exploration; and your services, so courteously offered, will be thankfully accepted. Your reputation as a man of letters and science is too well known to render such references as you allude to necessary."

THE additions to the Zoological Society's Gardens during the past week include a Barbary Ape (*Macacus inuus*) from North Africa, presented by Mr. E. Barclay; a White-fronted Capuchin (*Cebus albifrons*) from South America, presented by Mr. Shipman; a Pig-tailed Monkey (*Macacus nemestrinus*) from Java, presented by Mrs. Rintoul; a Leadbeater's Cockatoo (*Cacatua leadbeateri*) from Australia, presented by the Rev. S. J. Whitmee, C.M.Z.S.; an American Tantalus (*Tantalus loculator*), two Prince Albert's Curassows (*Crax alberti*), three Black-faced Spider Monkeys (*Ateles ater*) from U.S. Columbia, a Kinkajou (*Cercoleptes caudivolvulus*) from Honduras, deposited; a Tamandua Ant-eater (*Tamandua tetradactyla*), an American Darter (*Plotus anhinga*), an Ashy-headed Gull (*Larus cirrocephalus*) from South America, a Brazilian Motmot (*Momotus brasiliensis*) from Brazil, a Sorry Thrush (*Turdus tristris*) from Mexico, purchased.

SOCIETIES AND ACADEMIES

PARIS

Academy of Sciences, August 27.—M. Fizeau in the chair.—The following papers were read:—Note on M. Lavy's catalogue of stars of longitude and lunar culmination, by M. Faye. This catalogue of 521 stars is recommended as a work of precision which should be of real service.—Two general laws of geometric curves of order and class, *m* and *n*, by M. Chasles.—On the relation which should exist between the diameter of cores of iron and the thickness of their magnetising helix, by M. Du Moncel. It is shown from experiment that there is advantage in winding electro-magnets so that the thickness of the coil-layers is equal to the diameter of the cores; and for this law to be well applied, the diameter of the cores should naturally be proportioned to the electric intensity which is to act on them, and chosen so that this intensity develop in them a quantity of magnetism pretty near the point of saturation.—On an example of reduction of Abelian integrals with elliptic functions (continued), by Prof. Cayley.—Observations of the planets 173 and 174, and remarks on the discovery of this latter planet, by M. Stephan. On August 8 Mr. Watson observed a star of the tenth magnitude not marked on his maps, but it was not till the 16th that it was recognised as a planet. M. Borrelly first perceived the star on the 10th, and next day its planetary character was ascertained; priority is thus claimed for M. Borrelly.—Provisional geographical map of the planet Mars, by M. Flammarion. In this work (commenced in 1863) the author has aimed at giving a general *ensemble* of observations from the beginning.—Observations on a recent note of M. Du Moncel, on the best conditions of employment of galvanometers, by M. Raynaud.—Reply to a recent communication of M. Angot, on the evaporation in the region of the Algerian chotts, by M. Roudaire.—On the termination of the nerves in the electric apparatus of the torpedo, by M. Rouget. In opposition to MM. Boll, Ciaccio, and Ranvier, M. Rouget observes constantly, and reproduces by photography, a network in the ventral face, formed by the divisions of the last branches of the pale ramified fibres. The appearances of termination in buttons or free extremities, which show here and there in all the preparations, are manifestly connected with the network, in the enlarged photographs, by prolongations which escape direct observation.—Variations of the temperature during the total eclipse of the moon on August 24, 1877, by M. Berigny. There was a very marked cooling at 10 o'clock, and this had a perceptible effect on the minimum. M. Berigny asks did this arise from the astronomical fact, or was it a mere coincidence? M. Faye was not disposed to attribute it to the eclipse, and for two reasons: First, the sky was that night exceptionally clear, so that the terrestrial radiation must have been very active, giving a notable fall in the thermometer; second, physicists have had the greatest difficulty in rendering perceptible heat from the moon, even with the most delicate apparatus. So that when we are deprived of this radiation for an hour or two this can hardly affect our thermometers, still less our senses.

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